THE MINISTER OF STATE IN THE MINISTRY OF AGRICULTURE (SHRI HUKUMDEO NARAYAN YADAV): (a) and (b) The Government is considering to implement during the Tenth Five Year Plan a project called "Forecasting Agricultural Output using Space, Agro-meteorology and Land-based Observations" (FASAL) with the proposed plan outlay of Rs.96.50 crores for the five years. The project is jointly conceived by the Department of Space and the Department of Agriculture & Cooperation and is at the stage of seeking the approval of Expenditure Finance Committee.

(c) to (e) FASAL is umbrella project aiming to use diverse remote sensing applications for agriculture with primary focus on crop forecasting. To begin with, these assesments are planned at National and State levels. Other uses of remote sensing in agriculture cover land use & wasteland mapping, drought assessment, soil resource surveys, cropping system analysis, Horticulture crops coverage, etc.

The FASAL approach integrates inputs from three types of observations viz, remote sensing, weather and field observations, providing complementary and supplementary information, to make forecasts and inferences of desired coverage, accuracy, and timeliness. The features of FASAL techniques include multiple in season crop assessment. The technology-based approach has lesser scope of human bias.

Climate Change and Agricultural Production

2502. SHRIMATI AMBIKA SONI:
DR. T. SUBBARAMI REDDY:

Will the Minister of AGRICULTURE be pleased to state:

(a) whether the global warming has an impact on Indian agriculture which would result in up to 30 per cent drop in crop production by 2050;

(b) if so, whether the Government are considering to adopt strategies and resource conserving technologies, for sustainable farm development and improved productivity through low cost mechanism;

(c) whether this would have an impact on rice and wheat yields;

(d) if so, whether this was discussed in the South Asia Expert Workshop on Adaptation to Climate Change for Agricultural Productivity held in May, 2002; and

(e) if so, what were the main points discussed in the workshop?

THE MINISTER OF STATE IN THE MINISTRY OF AGRICULTURE (SHRI HUKUMDEO NARAYAN YADAV): (a) and (c) There is considerable uncertainty in the magnitude of global warming and its impact on agricultural production by the year 2050. The Inter-governmental Panel on Climate Change (IPCC), jointly establsihed in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), in its Third Assessment Report finanlized in 2001 has projected that global average surface temperature may increase by 1.4° C to 5.8° C over the period 1990-2100. The IPCC report specifically considers agriculture as highly vulnerable to impacts of climate change in the South Asian Region. Crop production and aquaculture would be threatend by thermal and water stresses, sea-level rise, increased flooding, and strong winds associated with intense tropical cyclones. The specific effect of global warming on Indian Agriculture, including rice and wheat would depend upon the actual change in temperature and other climatic features together with adaptation and mitigation strategies.

(b) Ministry of Agriculture has been adopting various resource conservation programmes and schemes to promote efficient utilization of water, land, nutrients and pesticides etc. for sustainable farm development in the country. Some major programmes and schemes are as under:

1. National Watershed Development Project for Rainfed Areas (NWDPRA).
2. Soil conservation for Enhancing Productivity of Degraded lands in the catchments of River Valley Projects and Flood Prone Rivers.
3. Reclamation of alkali soils.
4. Watershed Development Project in Shifting Cultivation Areas (WDSCA).
5. National Project on Development and Use of Bio-fertilisers.
6. Promotion of Integrated Pest Management.
7. National Project on organic farming.
8. Promotion of zero tillage.
9. Promotion of drip and sprinkler irrigation under the scheme Development of Horticulture through Plasti-culture Intervention.

(d) and (e) Yes sir. Main goal of the South Asia Expert Workshop on Adaptation to Climate Change for Agricultural Productivity held in May 2002 had two objectives; (i) to increase awareness in the the region of the impact of climate change on agriculture and about the existence of potential solutions. (ii) to make recommendations to the Eighth Conference of Parties (COP8) of the UN Framework Convention on Climate Change (UNFCCC) being hosted in New Delhi in October 2002. The workshop discussed vulnerability, adaptation and mitigation issues of Agriculture in the South Asian Region. Some key recommendations arrived at in the Workshop are as follows:

1. Sustainable development policies and programmes in areas such as watershed development, promotion of resource conserving technologies, natural resource management and development of plant varieties should be taken as no regret measures and need to be supported and strengthened.

2. Adaptation science and policies should be holistic *i.e.*, farming systems based rather than single commodity or single discipline.

3. There is a need for adopting an action-based framework/guidelines by mainstreaming adaptation into national and regional planning policies. The major components of such a framework would be:

   - A cafeteria of programmes and projects, which could be adopted by national governments.
   - Provide additional support to on-going governmental programmes, which have an adaptation element to combat climate change.
   - Provide incentive structure for those promoting adaptation. Role of farmers mitigating greenhouse gases need to be positively recognized within the Clean Development Mechanism of the Kyoto Protocol.
   - Promote capacity building programmes.
   - Provide for networking of international, regional and national institutions for experience sharing.
   - Documentation of best practices and its dissemination to the farmers.
   - Monitoring and evaluation of adaptation process.

4. There is need of strengthening public research on adaptation for both international as well as national research systems.

5. International funding support shall be required for the operationalization of necessary adaptation and mitigation measures.

ICAR research on transgenic crops

†2503. SHRI HARENDRA SINGH MALIK: Will the Minister of AGRICULTURE be pleased to state:

(a) whether Indian Council of Agriculture Research has completed its research on transgenic crops;

(b) if so, the results thereof; and

(c) if not, the reasons for the delay and by when this research work is likely to be completed?

THE MINISTER OF STATE IN THE MINISTRY OF AGRICULTURE (SHRI HUKUMDEO NARAYAN YADAV): (a) The research on transgenic crops is of a continuous nature. A few institutes of the Indian Council of Agricultural Research are involved in the development of transgenic crops mainly using Bt genes for insect resistance.

(b) Beside cotton, the transgenics having resistance to insect pests in rice, tomato, brinjal etc. are undergoing limited field tests. The National Research Centre on Plant Biotechnology, Indian Agricultural Research Institute has developed Bt Rice and Bt Brinjal for protection from harmful lepiodopteran insects. Osmotin Potato and Annexin Brassica have been developed for drought resistance. These are under observation before their testing as per the Department of Biotechnology guidelines.

(c) The research work on developement of transgenics in different crops for different purposes is of a continuous nature. In cotton, 3 hybrids are already recommended for cultivation. In other crops research is at different stages.

After transformation and development of transgenics, the biosafety and toxicological studies are conducted under the aegis of the Department of Biotechnology, Ministry of Science and Technology, which is the nodal

†Original notice of the question was received in Hindi.